

ULTRA 50

3-BAND A.C. SUPERHET

A SHORT-WAVE range of 16.8-50 metres is covered by the Ultra 50 4-valve (plus rectifier) A.C. 3-band superhet. Provision is made for connecting an extension speaker, and a plug and socket arrangement allows the internal speaker to be cut out of circuit.

The standard model is for mains of 200-250 V, 40-100 C/S, but a special model is made for 100-130 V. This *Service Sheet* was prepared on one of the former.

CIRCUIT DESCRIPTION

Aerial input by tapping on tuning coil **L2** (S.W.) and via coupling coil **L1** (M.W. and L.W.) to single tuned circuits **L2, C27** (S.W.), **L3, C27** (M.W.) and **L4, C27** (L.W.).

First valve (**V1, Mazda metallised AC/VP1**) is a variable-mu R.F. pentode operating as signal frequency amplifier with tuned anode couplings **L5, C31** (S.W.), **L6, C31** (M.W.) and **L7, C31** (L.W.) to second valve (**V2, Mazda metallised AC/TH1**), a triode hexode operating as frequency changer with internal coupling. Anode coils **L9** (S.W.), **L11** (M.W.) and **L13** (L.W.) are tuned by **C37**; parallel trimming by **C32** (S.W.), **C33** (M.W.) and **C13, C34** (L.W.); series tracking by **C12** (S.W.), **C35** (M.W.) and **C36** (L.W.). Grid reaction coils **L8** (S.W.), **L10** (M.W.) and **L12** (L.W.).

Third valve (**V3, Mazda metallised AC/VP1**) is a variable-mu R.F. pentode operating as intermediate frequency

coupling condenser **C17**, manual volume control **R15** and I.F. stopper resistance **R17** to C.G. of pentode section. Fixed tone correction in anode circuit by **C20**. Provision for connection of low impedance external speaker across secondary of output transformer **T1**. A plug and socket device in the speech coil circuit of the internal speaker permits it to be muted if desired.

Second diode of **V4**, fed from **V3** anode via condenser **C18**, provides D.C. potentials which are developed across load resistances **R21** and **R22** and fed back through decoupling circuits as G.B. to R.F., F.C. and I.F. valves, giving automatic volume control.

Delay voltage is obtained from drop along **V4** cathode resistances **R18, R19**. H.T. current is supplied by I.H.C. full-wave rectifying valve (**V5, Mazda UU3 or UU4**). Smoothing by speaker field **L20** and large capacity wet electrolytic condensers **C22** and **C23**.

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, remove the four control knobs (recessed grub screws) and the four bolts (with washers) holding the chassis to the bottom of the cabinet. The chassis can now be withdrawn to the extent of the leads.

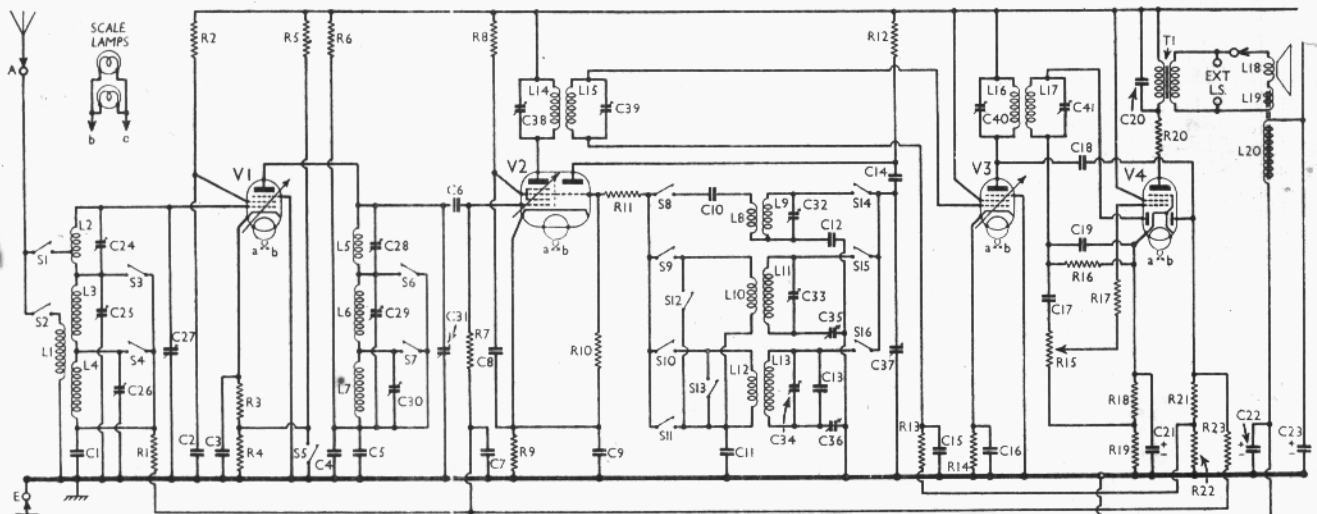
When replacing, do not forget the cardboard washers on the spindles of the wave-change switch and volume controls. These should be fitted before the

chassis is inserted in the cabinet. To free the chassis entirely, unsolder the leads from the speaker. *When replacing,* connect them as follows, numbering the tags from bottom to top:—1, red; 2, yellow; 3, green/black; 4, no external connection; 5, black.

Removing Speaker.—To remove the speaker from the cabinet, remove one of the clamps holding it to the sub-baffle and slacken the other two (nuts and spring washers). *When replacing,* see that the transformer is pointing to the top left-hand corner of the cabinet.

COMPONENTS AND VALUES

RESISTANCES		Values (ohms)
R1	V1 C.G. decoupling	1,000,000
R2	V1 S.G. H.T. feed	30,000
R3	V1 fixed G.B. potentiometer	138
R4	and S.W. sensitivity re-	6,900
R5	sistances	80,900
R6	V1 anode H.T. feed	4,00
R7	V2 hexode C.G. resistance ..	1,000,000
R8	V2 S.G. H.T. feed	30,000
R9	V2 fixed G.B. resistance ..	200
R10	V2 osc. C.G. resistance	25,000
R11	V2 osc. C.G. circuit stabiliser	60
R12	V2 osc. anode H.T. feed ..	40,000
R13	V3 C.G. decoupling	1,000,000
R14	V3 fixed G.B. resistance ..	30
R15	Manual volume control ..	1,000,000
R16	V4 signal diode load	500,000
R17	V4 C.G. I.F. stopper	1,000
R18	V4 G.B. and A.V.C. delay	138
R19	voltage resistances	138
R20	V4 anode circuit stabiliser ..	60
R21	V4 A.V.C. diode load	250,000
R22	resistances	750,000
R23	V1, V2 A.V.C. line decoupling	1,000,000



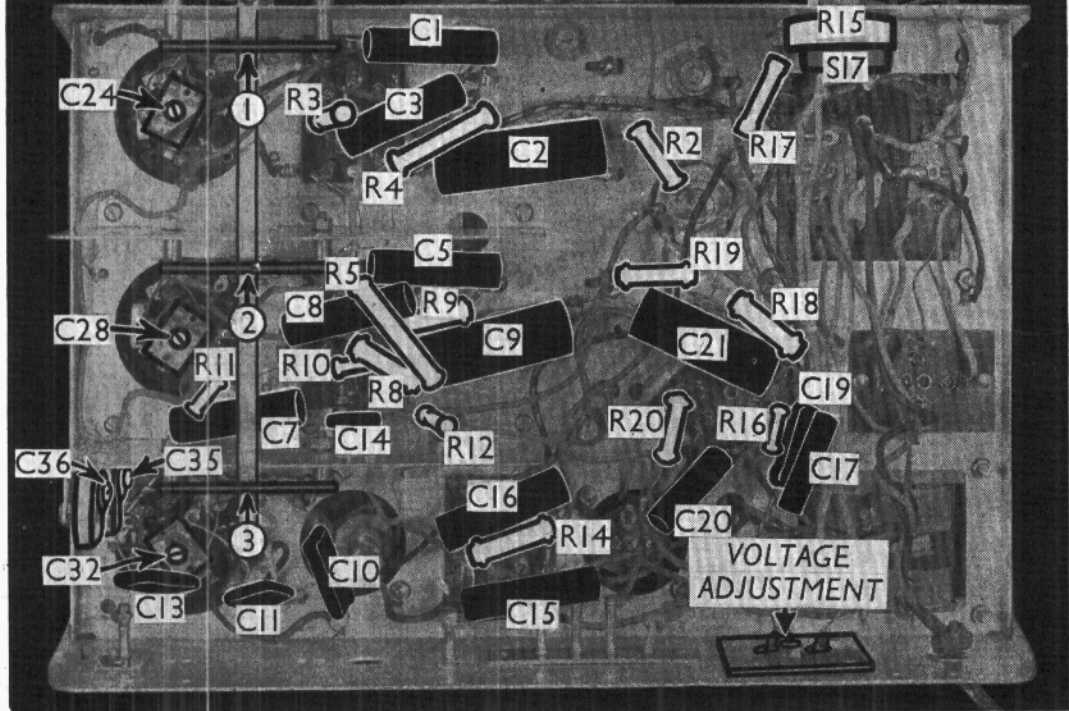
amplifier with tuned-primary tuned-secondary transformer couplings **C38, L14, L15, C39** and **C40, L16, L17, C41**. Intermediate frequency 456 KC/S.

Diode second detector is part of double diode pentode output valve (**V4, Mazda AC/2Pen/DD**). Audio-frequency component in rectified output is developed across load resistance **R16** and passed via

Circuit diagram of the Ultra 50 3-band A.C. superhet. The scale lamps are run from a tapping on the heater secondary of **T2**. **S5** is a sensitivity switch which is included in the wavechange units, and closes on S.W. only.

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Under - chassis view. Note the three trimmers at the bases of the coil units, and the two trackers mounted on the side of the chassis. The three switch units are indicated, and are shown in detail in the diagrams on page VIII.



CONDENSERS		Values (μF)
C1	V1 C.G. decoupling	0·05
C2	V1 S.G. decoupling	0·5
C3	V1 cathode by-pass	0·1
C4	V1 anode R.F. by-pass	0·01
C5	V1 anode decoupling	0·1
C6	V2 hexode C.G. condenser	0·0001
C7	V2 hexode C.G. decoupling	0·05
C8	V2 S.G. decoupling	0·1
C9	V2 cathode by-pass	0·5
C10	V2 osc. S.W. C.G. condenser	0·0001
C11	V2 osc. M.W. and L.W. R.F. by-pass	0·001
C12	Oscillator circuit S.W. tracker	0·004
C13	Oscillator circuit L.W. fixed trimmer	0·0001
C14	V2 osc. anode coupling	0·0001
C15	V3 C.G. decoupling	0·05
C16	V3 cathode by-pass	0·1
C17	A.F. coupling to V4	0·01
C18	V4 A.V.C. diode coupling	0·000
C19	I.F. by-pass	0·00
C20	V4 anode tone corrector	0·01
C21*	V4 cathode by-pass	50·0
C22*		8·0
C23*	H.T. smoothing	32·0
C24†	Aerial circuit S.W. trimmer	—
C25†	Aerial circuit M.W. trimmer	—
C26†	Aerial circuit L.W. trimmer	—
C27†	Aerial circuit tuning	—
C28†	V1 anode circuit S.W. trimmer	—
C29†	V1 anode circuit M.W. trimmer	—
C30†	V1 anode circuit L.W. trimmer	—
C31†	V1 anode circuit tuning	—
C32†	Osc. circuit S.W. trimmer	—
C33†	Osc. circuit M.W. trimmer	—
C34†	Osc. circuit L.W. trimmer	—
C35†	Osc. circuit M.W. tracker	0·0006
C36†	Osc. circuit L.W. tracker	0·0003
C37†	Osc. circuit tuning	—
C38†	1st I.F. trans. pri. tuning	—
C39†	1st I.F. trans. sec. tuning	—
C40†	2nd I.F. trans. pri. tuning	—
C41†	2nd I.F. trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial M.W. and L.W. coupling	15·0
L2	Aerial circuit S.W. tuning coil (total)	0·1
L3	Aerial circuit M.W. tuning coil	4·1
L4	Aerial circuit L.W. tuning coil	12·0
L5	V1 anode S.W. tuning coil	0·1
L6	V1 anode M.W. tuning coil	4·1
L7	V1 anode L.W. tuning coil	12·0
L8	Oscillator grid S.W. reaction	12·0
L9	Osc. anode S.W. tuning coil	0·1
L10	Oscillator grid M.W. reaction	1·5
L11	Osc. anode M.W. tuning coil	3·7
L12	Oscillator grid L.W. reaction	2·0
L13	Osc. anode L.W. tuning coil	11·0
L14	1st I.F. trans. Pri.	5·75
L15	Sec.	5·75
L16	2nd I.F. trans. Pri.	5·75
L17	Sec.	5·75
L18	Speaker speech coil	2·0
L19	Hum neutralising coil	0·1
L20	Speaker field coil	930·0
T1	Output trans. Pri.	325·0
	Sec.	0·18
	Pri. total	24·0
T2	Mains Heater sec. (total)	0·1
	trans. Rect. heat. sec.	0·14
	H.T. sec. (total)	500·0
S1-S16	Waveband switches	—
S17	Mains switch, ganged R15	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 235 V, using the 230-250 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 1,200 V scale of an Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 AC/VP1	250	0·3	225	0·1
V2 AC/TH1*	260	2·1	85	6·4
V3 AC/VP1	260	19·0	260	4·7
V4 AC/2Pen/DD	245	34·0	260	7·2
V5 UU4	310†	—	—	—

* Oscillator anode 80 V, 3·5 mA.
† Each anode, A.C.

GENERAL NOTES

Switches.—S1-S16 are the wave-change switches, ganged in three rotary units beneath the chassis, and indicated in our under-chassis view. The arrows show the directions in which the units are seen in the diagrams on page VIII. Note that some of the tags are blank, and there is a fourth setting of the control knob.

The fourth position of the control closes S11 and mutes radio.

S12 and S13 are formed by a metal plate on the rotor of the third unit. In the L.W. and the fourth position, this plate moves over to the other side of the unit, connecting one side of S11 to S14, and (in the fourth position) one side of S14 to S15. For the sake of clarity, the extra switches so formed, which are merely incidental, are not shown in the circuit diagram.

The table (page VIII) gives the switch positions for the three control settings, starting from fully anti-clockwise. O indicates open, and C closed.

S17 is the Q.M.B. mains switch, ganged with the volume control R15.

Continued overleaf

ULTRA 50—Continued

Coils.—L1-L4, L5-L7, L8-L13 and the I.F. transformers L14, L15 and L16, L17 are in five screened units on the chassis deck. The trimmers in the first three units are reached through holes near the bottoms of the cans. Their positions are roughly indicated by arrows in the plan chassis view. The I.F. trimmers are at the tops of their respective cans. Most of the units also contain one or more condensers and resistances.

Scale Lamps.—These are two Osram 4.5 V 0.3 A M.E.S. types, wired in parallel and run from a tapping on the T2 heater secondary.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (2-4 O) external speaker, such as the Ultra 30 (chassis model) or 45 (cabinet model). The internal speaker can be cut out, if desired, by the plug

SWITCH TABLE

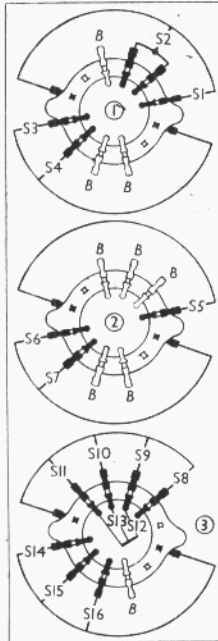
Switch	S.W.	M.W.	L.W.
S1	C	O	O
S2	O	C	O
S3	C	O	O
S4	O	C	O
S5	C	O	O
S6	C	O	O
S7	O	C	O
S8	C	O	O
S9	O	C	O
S10	O	O	C
S11	O	O	O
S12	C	O	O
S13	C	O	O
S14	C	O	O
S15	O	C	O
S16	O	O	C

* Closed in fourth position.

and socket to the left of the external speaker sockets.

Trimmers.—C24, C28 and C32 are adjusted from beneath the chassis. C35 and C36 can be reached from the left side of the chassis. All the other trimmers are inside their respective coil cans, and are adjustable through holes provided in them.

Condenser C12.—This tracker, inside the oscillator coil unit, consists of two fixed condensers connected in parallel.



Condenser C20.

—In our model this is connected from the top of R20 to H.T. positive line, but in early chassis it is taken from the top of R20 to chassis. This modification should be carried out on chassis received for service. Merely disconnect one end of C20 from chassis, and connect it to the screening grid tag of V4 holder.

The three switch units, looking from the rear of the underside of the chassis.

Resistance R4.—A 6,990 O resistance is fitted in the chassis, but a 7,000 O type could, of course, be used for replacement.

Anti-Static Aerials.—It is pointed out that when an anti-interference aerial with low impedance coupling is used, it is necessary to connect a 0.01 μF condenser in series with the aerial lead and the aerial socket of the set in order to avoid short-circuiting the A.V.C. on the S.W. band.

CIRCUIT ALIGNMENT

With the gang condenser at maximum, pointer should coincide with top left-hand white line of scale.

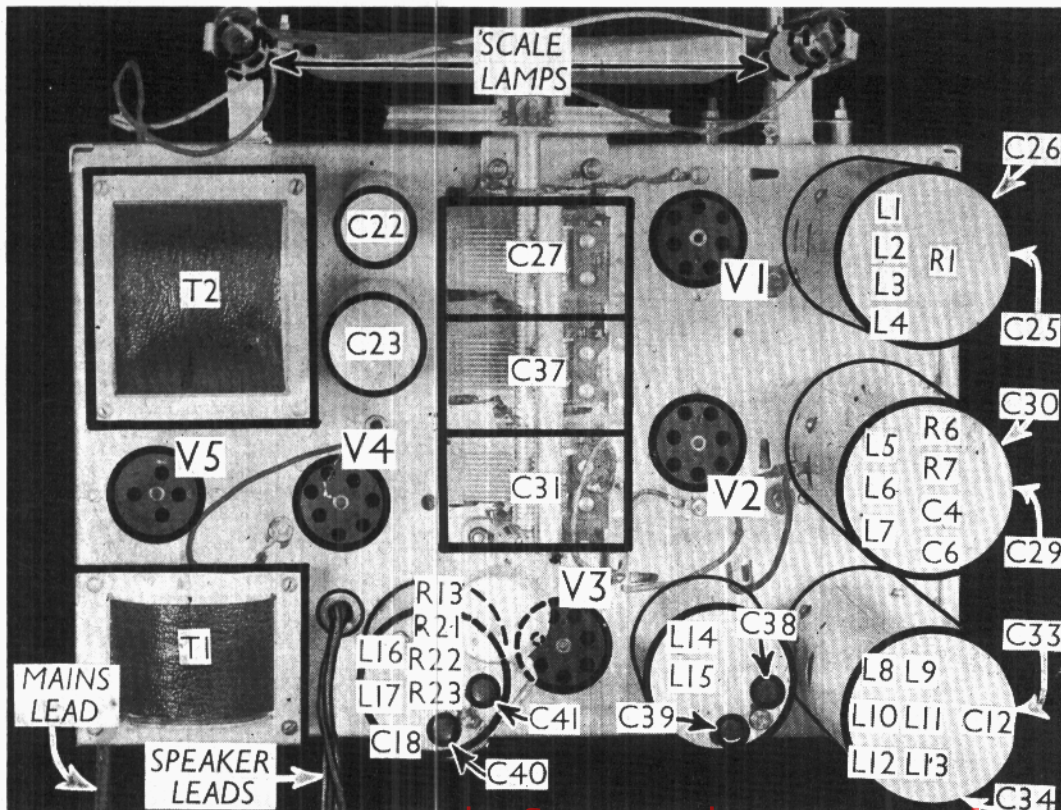
I.F. Stages.—Turn gang condenser to maximum. Connect a signal generator to A and E sockets, and an output meter to the external L.S. sockets, and feed in 456 KC/S signal. Adjust C40, C41, C39, C38 in that order for maximum output, reducing input progressively as the circuits come into line.

R.F. and Oscillator Circuits.—M.W.—Feed in a 200 m. signal, tune to 200 m. on the scale, and adjust C33 for maximum output, then C29 and C25.

Feed in a 500 m. signal, tune to 500 m. on scale and adjust C35 for maximum output, rocking the gang meanwhile for optimum results. Calibration should be accurate to plus or minus 7 metres.

L.W.—Feed in a 1,000 m. signal, tune to 950 m. on scale, and adjust C34 for maximum output. Then adjust C30 and C26. Feed in a 1,700 m. signal, tune to 1,700 m. on scale, and adjust C36 for maximum output, rocking the gang meanwhile for optimum results.

S.W.—Feed in a 17.1 m. (17.55 MC/S) signal, and tune to 17.1 m. on scale. Screw up C32 fully, then unscrew it slowly until the second peak (least capacity) is reached. Adjust accurately on this peak. Then adjust C28 and C24 for maximum output. Fixed tracking is employed on this band. Check calibration against actual stations.



Plan view of the chassis. Most of the coil units contain additional components. The positions of the trimmers are indicated by arrows.

For more information remember